

SUPPORT OF FLEXIBLE COMPONENT AND LIGHT-EMITTING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

One embodiment of the present invention relates to a support of a flexible component, and a light-emitting device.

Note that one embodiment of the present invention is not limited to the above technical field. The technical field of one embodiment of the present invention disclosed in this specification and the like relates to an object, a method, or a manufacturing method. In addition, one embodiment of the present invention relates to a process, a machine, manufacture, or a composition of matter. Specifically, examples of the technical field of one embodiment of the present invention disclosed in this specification include a semiconductor device, a display device, a liquid crystal display device, a light-emitting device, a lighting device, a power storage device, a storage device, an imaging device, a method for driving any of them, and a method for manufacturing any of them.

In this specification and the like, a semiconductor device generally means a device that can function by utilizing semiconductor characteristics. A transistor and a semiconductor circuit are embodiments of semiconductor devices. In some cases, a storage device, a display device, an imaging device, or an electronic device includes a semiconductor device.

2. Description of the Related Art

In recent years, research and development have been extensively conducted on light-emitting elements utilizing electroluminescence (EL). In a basic structure of such a light-emitting element, a layer containing a light-emitting substance is interposed between a pair of electrodes. By applying voltage to the element, light emission from the light-emitting substance can be obtained.

The above light-emitting element is a self-luminous element; thus, a light-emitting device including the light-emitting element has advantages such as high visibility, no necessity of a backlight, and low power consumption. In addition, the light-emitting device has advantages in that it can be manufactured to be thin and lightweight and has fast response speed.

Since a light-emitting device including the above light-emitting element can have flexibility, use of the light-emitting device for a flexible substrate has been proposed.

As a method for manufacturing a light-emitting device using a flexible substrate, a technology in which a separation layer is formed over a substrate, a glass substrate or a quartz substrate, a semiconductor element such as a thin film transistor is formed over the separation layer, and then, the semiconductor element is transferred to another substrate (e.g., a flexible substrate) has been developed (see Patent Document 1).

REFERENCE

Patent Document

[Patent Document 1] Japanese Published Patent Application No. 2003-174153

SUMMARY OF THE INVENTION

Components such as a light-emitting device formed over a flexible substrate can improve portability by being folded utilizing their flexibility. On the other hand, sufficient

mechanical strength cannot be obtained because of their small thicknesses. For these reasons, a support having sufficient mechanical strength is preferably provided to protect the flexible component from external damage or unexpected shock in carrying.

Although the flexible component can be bent to a certain degree, an internal structure is physically broken when the flexible component is bent with an extremely small curvature radius. For that reason, even when the support is used for protection, a bendable region of the flexible component has to maintain the allowable curvature radius.

For example, a foldable support includes two boards connected by a hinge, and one flexible component (e.g., a light-emitting device) is across the two boards in a state where the support is opened. Here, to fold the support safely without breaking the flexible component, it is necessary to maintain the allowable curvature radius of the flexible component in the vicinity of the hinge.

Maintaining the curvature radius can be easily achieved without devising the hinge in the following manner: the flexible component is fixed to one of the two boards connected by the hinge and fixed to the other board so as to be slid in the horizontal direction. However, the design is poor and the reliability is decreased.

Thus, an object of one embodiment of the present invention is to provide a support for supporting a flexible component. Another object is to provide a support for performing bending operation without decreasing the reliability of a flexible component. Another object is to provide a support for maintaining the allowable curvature radius of a flexible component. Another object is to provide a support for improving the reliability of a flexible component. Another object is to provide a support for suppressing a decrease in electrical characteristics of a flexible component. Another object is to provide a novel support of a flexible component. Another object is to provide a novel light-emitting device.

Note that the description of these objects does not disturb the existence of other objects. In one embodiment of the present invention, there is no need to achieve all the objects. Other objects will be apparent from and can be derived from the description of the specification, the drawings, the claims, and the like.

The present invention relates to a support of a flexible component, a support of a flexible component for performing bending operation stably without breaking the flexible component, and a light-emitting device including the flexible component. Note that the support of the flexible component serves as a protector of the flexible component in some cases depending on the purpose or situations.

According to one embodiment of the present invention, a support of a flexible component includes a first substrate, a second substrate, a rack, a pinion, and a hinge. The rack is fixed to a corner of the first substrate. A center of the pinion is fixed to a shaft of the hinge. A slide function is provided in one of hinge pieces of the hinge. The shaft of the hinge is fixed to the other of the hinge pieces of the hinge. The hinge is provided over the first substrate and the second substrate so that teeth of the rack and teeth of the pinion engage with each other in a state where the second substrate is adjacent to the side of the corner of the first substrate to which the rack is fixed. The first substrate and the one of the hinge pieces of the hinge are fixed to each other in a state where the first substrate can be moved in a horizontal direction with the slide function while being overlapped with the one of the hinge pieces of the hinge. The second substrate and the other of the hinge pieces of the hinge are fixed to each other. When the second substrate is moved, a rotational force of the pinion is transmitted to the